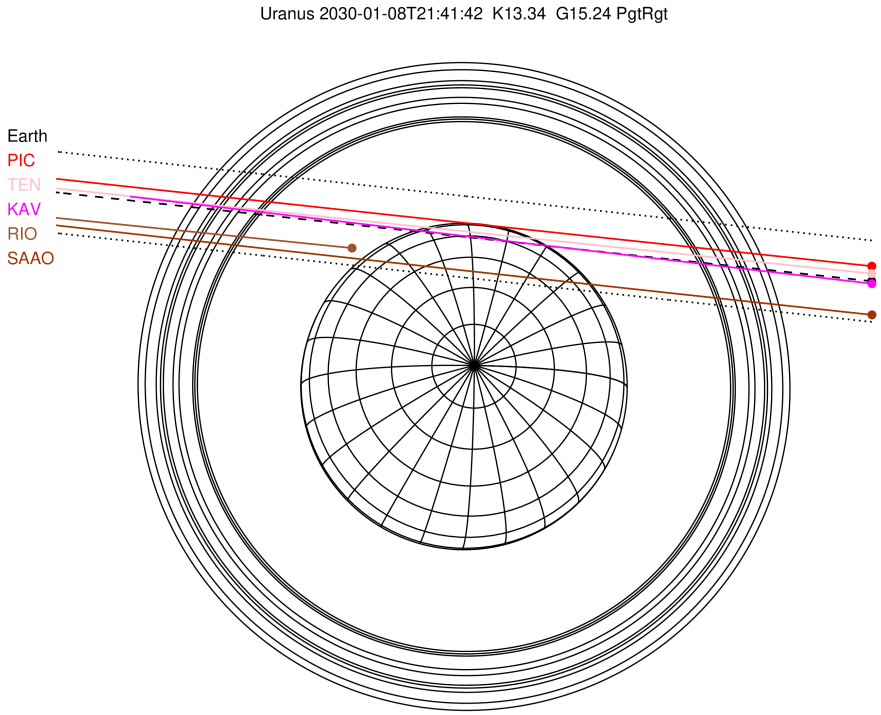
Stellar occultation prediction by rfrench@wellesley.edu Sat Jun 24 23:49:07 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2030-01-08T21:41:42.810
Event type : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Gaia source ID : 3413214019120800640
2Mass ID (if available) : 04541252+2236484

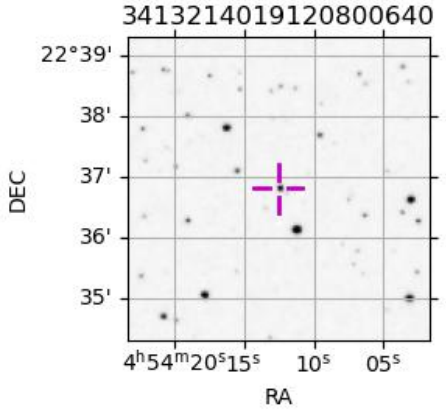
ICRS Star Coord at Epoch: 04h 54m 12.52758s +22:36:48.43052s
RUWE (>1.4 is poor) : 1.03
K magnitude : 13.337
G magnitude : 15.236
RP magnitude : 14.569
BP magnitude : 15.726
DUPflag : 0
Distance (au) : 18.390
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -18.54
Sun-Target sep (deg) : 146.61
Sun-Moon sep (deg) : 86.77
B (ring opening deg) : 81.76
PA of pole (deg) : -26.19

#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



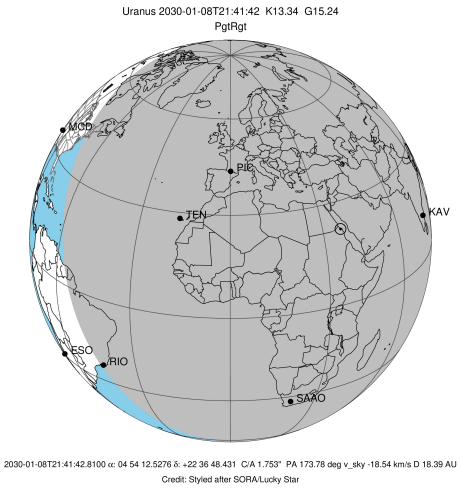
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

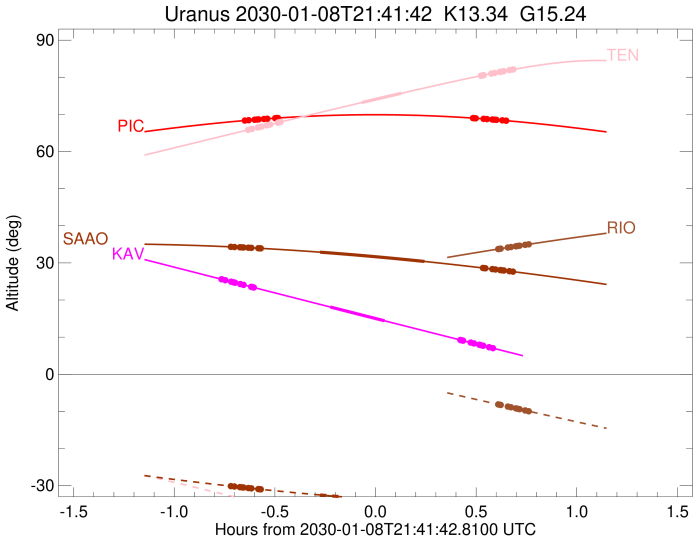
Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	++++++++++		++++++++++	JAN 08 21:02 - JAN 08 22:20	PnnRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4					PnnRnn
MCD	McDonald Obs. 2.7m	30.7	256.0					PnnRnn
TEN	Teide Obs./Tenerife	28.3	343.5	++++++++++	+ +	++++++++++	JAN 08 21:03 - JAN 08 22:22	PieRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	++++++++++	+ +	++++++++++	JAN 08 20:55 - JAN 08 22:16	PieRie
RIO	Rio de Janeiro	-22.9	316.8			++++++++++	JAN 08 22:18 - JAN 08 22:27	PnnRne
ESO	European Southern Obs	-29.3	289.3					PnnRnn
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8	++++++++++	+ +	++++++++++	JAN 08 20:58 - JAN 08 22:22	PieRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



Uranus_2030-01-08T21_41_42.8100_PIC.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:15:35 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2030-01-08T21:41:32.960
Event type : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code : PIC
Location : Pic du Midi
Latitude (deg) : 42.93656
E. Longitude (deg) : 0.14231
Altitude (km) : 2.890
Gaia source ID : 3413214019120800640
2Mass ID (if available) : 04541252+2236484
ICRS Star Coord at Epoch: 04h 54m 12.52758s +22:36:48.43052s
RUWE (>1.4 is poor) : 1.03
K magnitude : 13.337
G magnitude : 15.236
RP magnitude : 14.569
BP magnitude : 15.726
DUPflag : 0
Distance (au) : 18.390
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -18.54
Sun-Target sep (deg) : 146.61
Sun-Moon sep (deg) : 87.65
B (ring opening deg) : 81.76
PA of pole (deg) : -26.19
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.911
C/A sky separation (km) : 25484.6
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.spk
ura111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ura111.bsp
ura161.bsp
vgr2.ura161.bsp
peph.ura160.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk





b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

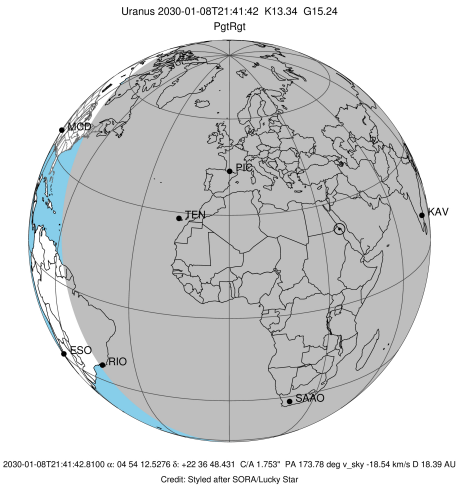
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-08T21:02:26.168		68.33	-46.77	51464.98	-16.42		
lambda	I	2030-01-08T21:03:54.414		68.44	-47.03	50026.71	-16.22		
delta	I	2030-01-08T21:05:41.560		68.57	-47.35	48300.35	-16.00		
gamma	I	2030-01-08T21:06:23.923		68.62	-47.47	47624.31	-15.91		
eta	I	2030-01-08T21:06:52.145		68.66	-47.56	47176.12	-15.85		
beta	I	2030-01-08T21:08:27.397		68.77	-47.84	45677.29	-15.62		
alpha	I	2030-01-08T21:09:31.305		68.84	-48.03	44684.95	-15.46		
4	I	2030-01-08T21:11:46.872		68.98	-48.43	42615.95	-15.07		
5	I	2030-01-08T21:12:07.111		69.00	-48.49	42304.21	-15.02		
6	I	2030-01-08T21:12:37.045		69.03	-48.58	41866.29	-14.92		

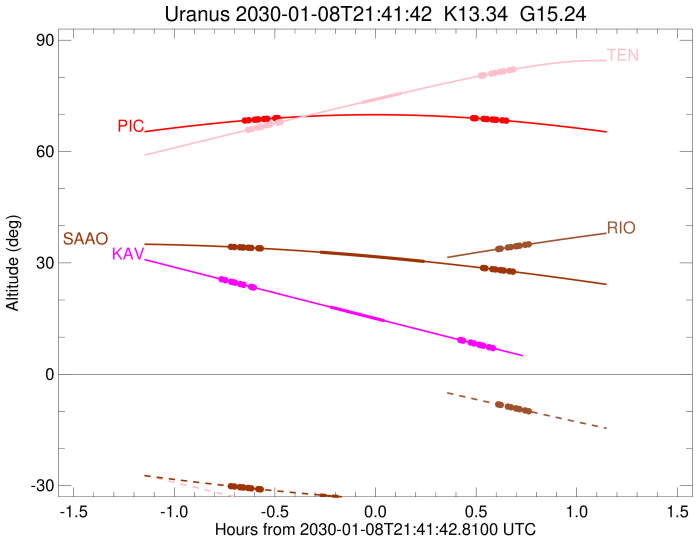
No planet occultations

6	E	2030-01-08T22:10:47.502		69.01	-58.36	41860.27	14.92		
5	E	2030-01-08T22:11:13.902		68.98	-58.43	42256.32	15.01		
4	E	2030-01-08T22:11:34.600		68.96	-58.48	42566.39	15.07		
alpha	E	2030-01-08T22:13:56.603		68.81	-58.85	44734.23	15.45		
beta	E	2030-01-08T22:14:55.156		68.74	-59.00	45644.15	15.61		
eta	E	2030-01-08T22:16:32.552		68.63	-59.25	47176.12	15.84		
gamma	E	2030-01-08T22:17:00.680		68.59	-59.32	47622.58	15.90		
delta	E	2030-01-08T22:17:43.175		68.54	-59.43	48300.35	15.99		
lambda	E	2030-01-08T22:19:30.381		68.41	-59.70	50026.71	16.21		
epsilon	E	2030-01-08T22:20:43.061		68.32	-59.88	51209.57	16.41		

Uranus_2030-01-08T21_41_42.8100_TEN.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:26:19 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2030-01-08T21:43:09.010
Event type : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code : TEN
Location : Teide Obs./Tenerife
Latitude (deg) : 28.30050
E. Longitude (deg) : 343.48909
Altitude (km) : 2.395
Gaia source ID : 3413214019120800640
2Mass ID (if available) : 04541252+2236484
ICRS Star Coord at Epoch: 04h 54m 12.52758s +22:36:48.43052s
RUWE (>1.4 is poor) : 1.03
K magnitude : 13.337
G magnitude : 15.236
RP magnitude : 14.569
BP magnitude : 15.726
DUPflag : 0
Distance (au) : 18.390
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -18.54
Sun-Target sep (deg) : 146.61
Sun-Moon sep (deg) : 87.66
B (ring opening deg) : 81.76
PA of pole (deg) : -26.19
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.812
C/A sky separation (km) : 24164.8
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.spk
ura111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ura111.bsp
ura161.bsp
vgr2.ura161.bsp
peph.ura160.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk





b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-08T21:03:27.736		65.78	-33.83	51457.96	-16.72		
lambda	I	2030-01-08T21:04:53.936		66.10	-34.15	50026.71	-16.53		
delta	I	2030-01-08T21:06:38.945		66.48	-34.53	48300.35	-16.34		
gamma	I	2030-01-08T21:07:20.399		66.63	-34.68	47624.46	-16.26		
eta	I	2030-01-08T21:07:48.011		66.73	-34.78	47176.12	-16.21		
beta	I	2030-01-08T21:09:21.035		67.07	-35.12	45677.67	-16.01		
alpha	I	2030-01-08T21:10:23.382		67.30	-35.34	44684.81	-15.87		
4	I	2030-01-08T21:12:35.238		67.78	-35.82	42615.66	-15.53		
5	I	2030-01-08T21:12:54.967		67.85	-35.89	42302.68	-15.48		
6	I	2030-01-08T21:13:23.954		67.96	-36.00	41865.12	-15.40		
Uranus	I	2030-01-08T21:37:32.645		73.18	-41.28	24990.23		8.21	8.59
Uranus	E	2030-01-08T21:49:23.565		75.68	-43.88	25184.55		6.61	6.92
6	E	2030-01-08T22:13:10.452		80.43	-49.11	41858.74	15.42		
5	E	2030-01-08T22:13:35.900		80.51	-49.21	42253.08	15.50		
4	E	2030-01-08T22:13:56.037		80.57	-49.28	42564.54	15.55		
alpha	E	2030-01-08T22:16:14.100		80.99	-49.79	44735.37	15.89		
beta	E	2030-01-08T22:17:10.998		81.16	-50.00	45643.76	16.03		
eta	E	2030-01-08T22:18:45.985		81.44	-50.34	47176.12	16.23		
gamma	E	2030-01-08T22:19:13.453		81.52	-50.45	47622.72	16.29		
delta	E	2030-01-08T22:19:54.955		81.64	-50.60	48300.35	16.37		
lambda	E	2030-01-08T22:21:39.812		81.93	-50.98	50026.71	16.56		
epsilon	E	2030-01-08T22:22:50.218		82.12	-51.24	51196.60	16.74		

Uranus_2030-01-08T21_41_42.8100_KAV.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:30:34 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2030-01-08T21:36:02.050
Event type : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code : KAV
Location : Kavalur Observatory
Latitude (deg) : 12.57556
E. Longitude (deg) : 78.83167
Altitude (km) : 0.722
Gaia source ID : 3413214019120800640
2Mass ID (if available) : 04541252+2236484
ICRS Star Coord at Epoch: 04h 54m 12.52758s +22:36:48.43052s
RUWE (>1.4 is poor) : 1.03
K magnitude : 13.337
G magnitude : 15.236
RP magnitude : 14.569
BP magnitude : 15.726
DUPflag : 0
Distance (au) : 18.390
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -18.54
Sun-Target sep (deg) : 146.61
Sun-Moon sep (deg) : 87.06
B (ring opening deg) : 81.76
PA of pole (deg) : -26.19
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.755
C/A sky separation (km) : 23412.8
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.spk
ura111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ura111.bsp
ura161.bsp
vgr2.ura161.bsp
peph.ura160.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
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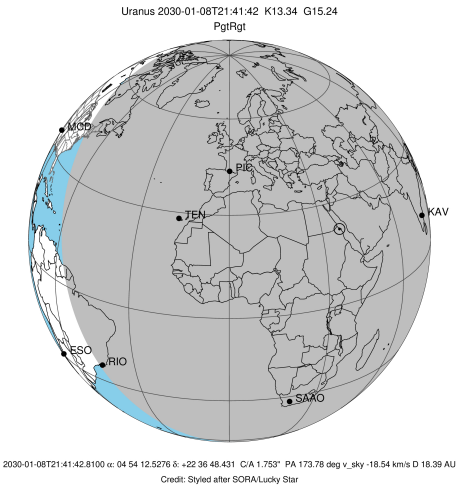
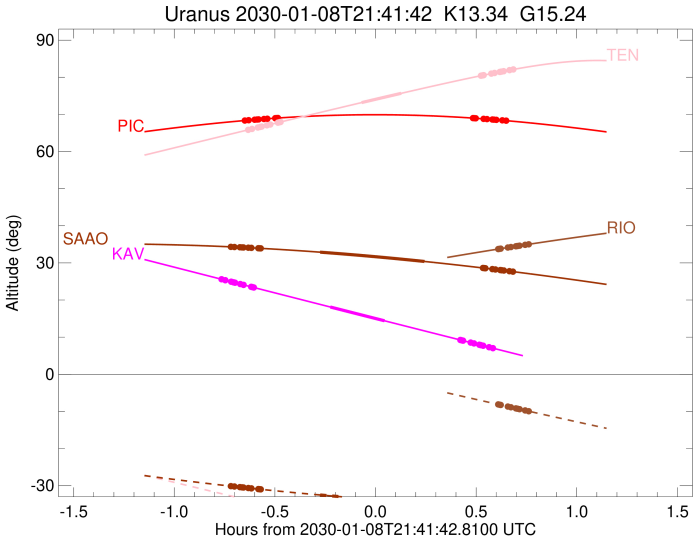
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk



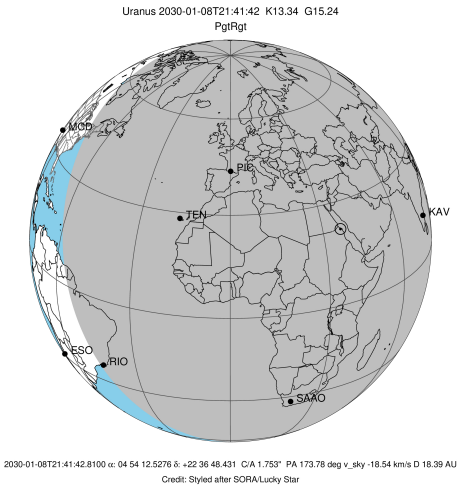


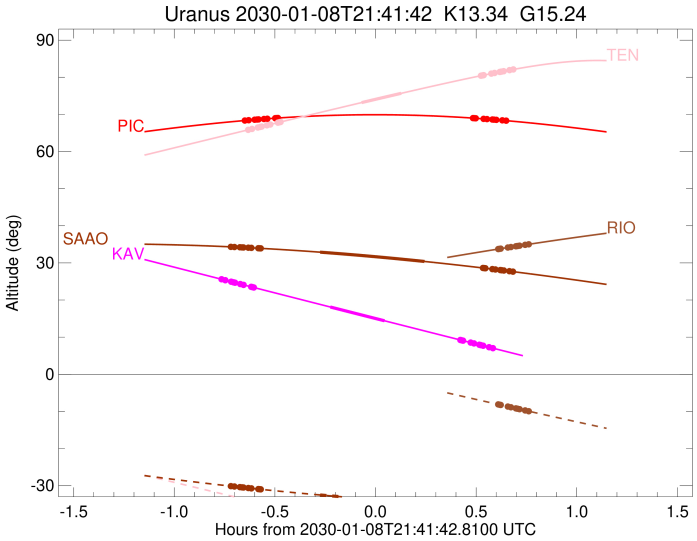
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-08T20:55:31.306		25.66	-58.96	51449.93	-16.72		
lambda	I	2030-01-08T20:56:57.012		25.33	-58.63	50026.71	-16.54		
delta	I	2030-01-08T20:58:41.948		24.93	-58.24	48300.35	-16.36		
gamma	I	2030-01-08T20:59:23.343		24.77	-58.08	47624.62	-16.29		
eta	I	2030-01-08T20:59:50.926		24.66	-57.98	47176.12	-16.23		
beta	I	2030-01-08T21:01:23.745		24.30	-57.63	45678.03	-16.05		
alpha	I	2030-01-08T21:02:25.955		24.07	-57.39	44684.71	-15.91		
4	I	2030-01-08T21:04:37.337		23.56	-56.90	42615.32	-15.60		
5	I	2030-01-08T21:04:57.062		23.48	-56.82	42301.14	-15.56		
6	I	2030-01-08T21:05:25.865		23.37	-56.71	41863.98	-15.48		
Uranus	I	2030-01-08T21:28:14.935		18.12	-51.50	24985.34		8.24	8.63
Uranus	E	2030-01-08T21:44:26.064		14.40	-47.78	25230.94		6.18	6.47
6	E	2030-01-08T22:07:01.281		9.24	-42.57	41858.40	15.37		
5	E	2030-01-08T22:07:26.788		9.14	-42.47	42252.37	15.45		
4	E	2030-01-08T22:07:47.018		9.06	-42.39	42564.15	15.49		
alpha	E	2030-01-08T22:10:05.808		8.54	-41.86	44735.59	15.79		
beta	E	2030-01-08T22:11:03.058		8.32	-41.64	45643.70	15.92		
eta	E	2030-01-08T22:12:38.764		7.95	-41.27	47176.12	16.10		
gamma	E	2030-01-08T22:13:06.461		7.85	-41.16	47622.74	16.15		
delta	E	2030-01-08T22:13:48.325		7.69	-41.00	48300.35	16.22		
lambda	E	2030-01-08T22:15:34.182		7.29	-40.59	50026.71	16.39		
epsilon	E	2030-01-08T22:16:45.228		7.02	-40.32	51194.98	16.56		

Uranus_2030-01-08T21_41_42.8100_RIO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:32:39 2023

```
target                  : Uranus
target radius (km)      :  25559.00
C/A epoch               : 2030-01-08T21:45:45.550
Event type              : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code           : RIO
Location                : Rio de Janeiro
Latitude (deg)          : -22.89506
E. Longitude (deg)      : 316.77708
Altitude (km)           :   0.033
Gaia source ID          : 3413214019120800640
2Mass ID (if available) : 04541252+2236484
ICRS Star Coord at Epoch: 04h 54m 12.52758s +22:36:48.43052s
RUWE (>1.4 is poor)     :   1.03
K magnitude             : 13.337
G magnitude             : 15.236
RP magnitude            : 14.569
BP magnitude            : 15.726
DUPflag                 : 0
Distance (au)           : 18.390
f0 (km)                 :       0.000
g0 (km)                 :       0.000
skyplane vel. (km/s)    : -18.54
Sun-Target sep (deg)    :  146.61
Sun-Moon sep (deg)      :   87.18
B (ring opening deg)    :   81.76
PA of pole (deg)        :  -26.19
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (")  :   1.484
C/A sky separation (km) :  19797.0
NAIF SPICE kernels      : RAJobs_U111+rgf15.spk
URKALLv1.spk
ura111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ura111.bsp
ura161.bsp
vgr2.ura161.bsp
peph.ura160.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
```



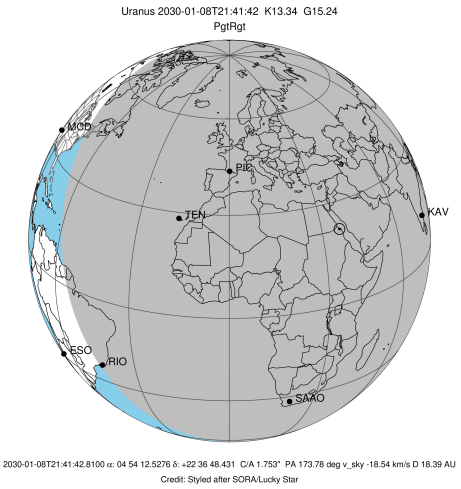


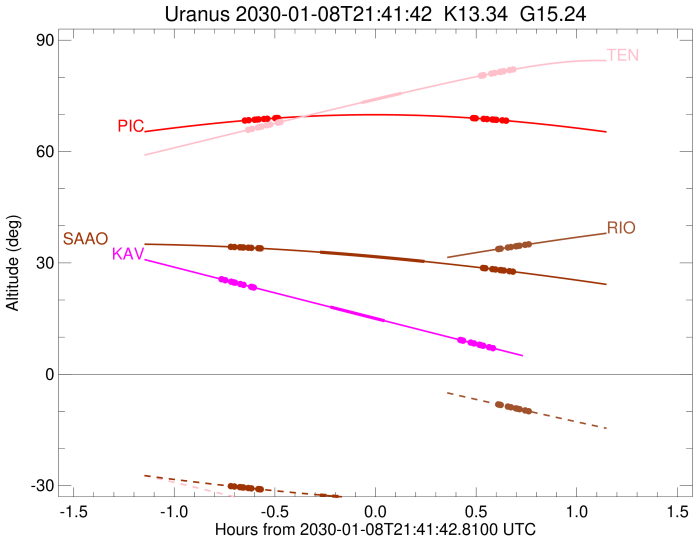
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-08T21:03:59.370		21.46	7.47x	51432.29	-17.38		
lambda	I	2030-01-08T21:05:20.629		21.70	7.18x	50026.71	-17.25		
delta	I	2030-01-08T21:07:01.024		22.01	6.82x	48300.35	-17.14		
gamma	I	2030-01-08T21:07:40.495		22.13	6.68x	47624.98	-17.08		
eta	I	2030-01-08T21:08:06.793		22.21	6.58x	47176.12	-17.05		
beta	I	2030-01-08T21:09:34.938		22.47	6.27x	45678.80	-16.93		
alpha	I	2030-01-08T21:10:33.876		22.65	6.06x	44684.61	-16.84		
4	I	2030-01-08T21:12:37.652		23.02	5.62x	42614.28	-16.63		
5	I	2030-01-08T21:12:56.356		23.08	5.55x	42297.04	-16.60		
6	I	2030-01-08T21:13:23.212		23.16	5.45x	41861.03	-16.55		
Uranus	I	2030-01-08T21:32:12.368		26.44	1.45x	25034.51		7.87	8.23
Uranus	E	2030-01-08T21:59:49.760		30.96	-4.33x	25404.79		4.21	4.41
6	E	2030-01-08T22:18:18.417		33.73	-8.12	41853.91	16.62		
5	E	2030-01-08T22:18:41.771		33.79	-8.20	42243.13	16.67		
4	E	2030-01-08T22:19:00.755		33.83	-8.26	42559.02	16.70		
alpha	E	2030-01-08T22:21:10.456		34.14	-8.70	44738.69	16.91		
beta	E	2030-01-08T22:22:03.768		34.27	-8.88	45642.73	17.00		
eta	E	2030-01-08T22:23:33.630		34.48	-9.18	47176.12	17.13		
gamma	E	2030-01-08T22:23:59.705		34.54	-9.27	47623.16	17.16		
delta	E	2030-01-08T22:24:39.102		34.63	-9.41	48300.35	17.21		
lambda	E	2030-01-08T22:26:19.029		34.86	-9.74	50026.71	17.34		
epsilon	E	2030-01-08T22:27:24.070		35.01	-9.96	51156.67	17.47		

Uranus_2030-01-08T21_41_42.8100_SAAO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:39:10 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2030-01-08T21:40:30.060
Event type : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code : SAAO
Location : So. Afr. Astro. Obs. (Sutherland)
Latitude (deg) : -32.37953
E. Longitude (deg) : 20.81070
Altitude (km) : 1.768
Gaia source ID : 3413214019120800640
2Mass ID (if available) : 04541252+2236484
ICRS Star Coord at Epoch: 04h 54m 12.52758s +22:36:48.43052s
RUWE (>1.4 is poor) : 1.03
K magnitude : 13.337
G magnitude : 15.236
RP magnitude : 14.569
BP magnitude : 15.726
DUPflag : 0
Distance (au) : 18.390
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -18.54
Sun-Target sep (deg) : 146.61
Sun-Moon sep (deg) : 87.27
B (ring opening deg) : 81.76
PA of pole (deg) : -26.19
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.354
C/A sky separation (km) : 18057.1
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.spk
ura111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ura111.bsp
ura161.bsp
vgr2.ura161.bsp
peph.ura160.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk





b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-08T20:58:21.168	34.33	-30.11	51418.95	-17.77			
lambda	I	2030-01-08T20:59:39.837	34.28	-30.24	50026.71	-17.66			
delta	I	2030-01-08T21:01:17.862	34.21	-30.40	48300.35	-17.56			
gamma	I	2030-01-08T21:01:56.352	34.18	-30.47	47625.23	-17.52			
eta	I	2030-01-08T21:02:22.010	34.16	-30.51	47176.12	-17.49			
beta	I	2030-01-08T21:03:47.864	34.10	-30.65	45679.26	-17.38			
alpha	I	2030-01-08T21:04:45.242	34.05	-30.74	44684.67	-17.31			
4	I	2030-01-08T21:06:45.548	33.96	-30.93	42613.44	-17.14			
5	I	2030-01-08T21:07:03.834	33.94	-30.96	42294.18	-17.12			
6	I	2030-01-08T21:07:29.798	33.92	-31.00	41859.05	-17.07			
Uranus	I	2030-01-08T21:25:10.688	32.89	-32.51	25077.43		7.53	7.88	
Uranus	E	2030-01-08T21:56:18.261	30.39	-34.50	25451.41		3.51	3.68	
6	E	2030-01-08T22:13:45.615	28.63	-35.20	41852.38	17.03			
5	E	2030-01-08T22:14:08.330	28.59	-35.21	42240.08	17.07			
4	E	2030-01-08T22:14:26.942	28.56	-35.22	42557.39	17.09			
alpha	E	2030-01-08T22:16:33.964	28.33	-35.28	44739.63	17.26			
beta	E	2030-01-08T22:17:26.147	28.23	-35.30	45642.47	17.33			
eta	E	2030-01-08T22:18:54.355	28.07	-35.34	47176.12	17.44			
gamma	E	2030-01-08T22:19:19.980	28.02	-35.35	47623.30	17.47			
delta	E	2030-01-08T22:19:58.698	27.95	-35.37	48300.35	17.51			
lambda	E	2030-01-08T22:21:37.030	27.77	-35.41	50026.71	17.60			
epsilon	E	2030-01-08T22:22:40.461	27.65	-35.43	51145.19	17.71			